

Automatic Installation Environment for SLES9

Description

This lab shows how to setup an automatic SLES9 installation environment, using PXE to start the boot and install process across the network. All the setup is done without user intervention. From the booting up process, components and packages selection, to the final stages and customization.

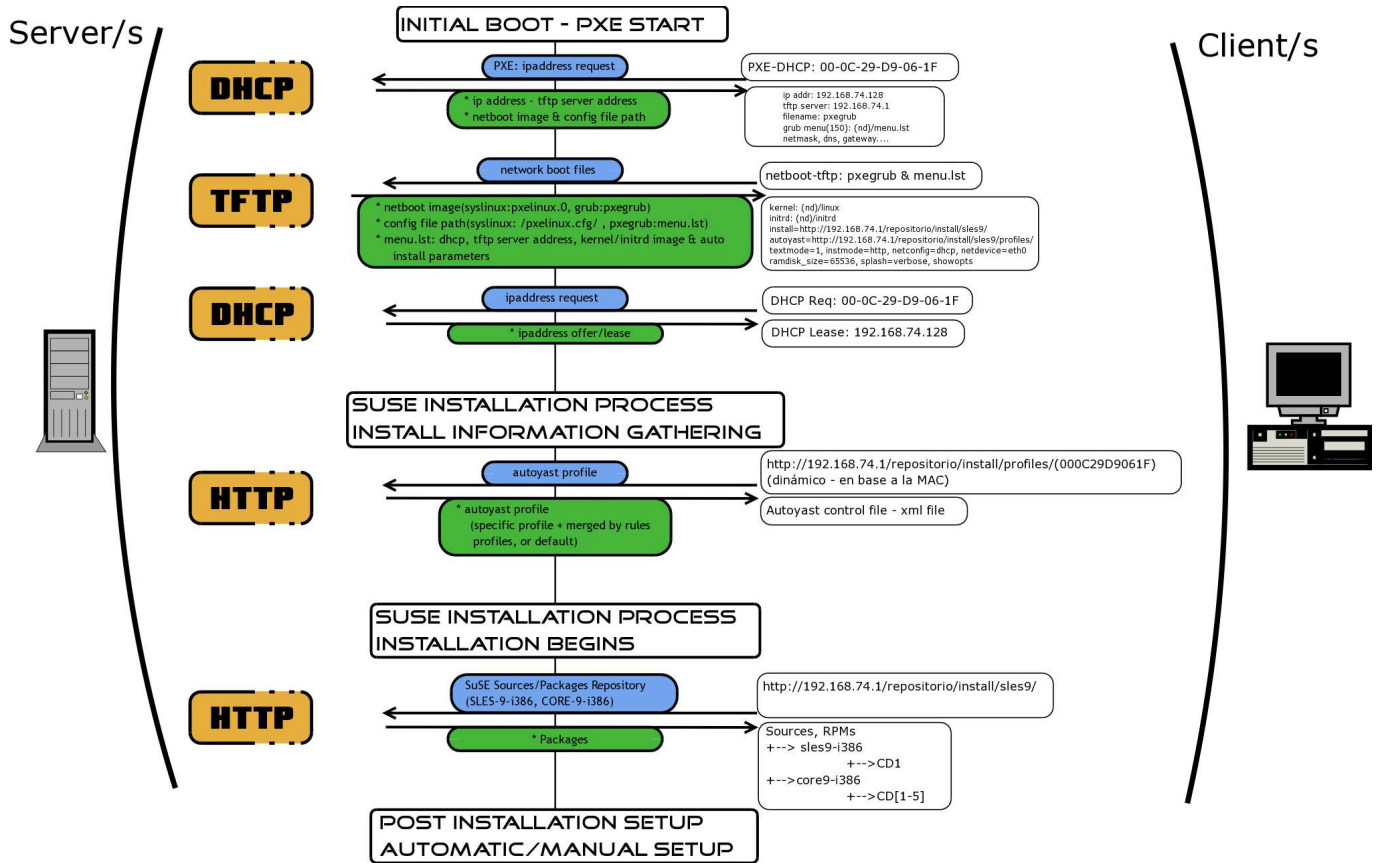
Table of Contents

Automatic Installation Environment for SLES9.....	1
Description.....	1
Setup components.....	2
The Whole Process.....	3
Installation Server Software.....	6
Building the SLES software repository.....	6
Enabling HTTP Access to SLES9 Repository.....	9
Install TFTP Server.....	10
Prepare network boot images.....	10
Install DHCP server.....	12
Create the control file.....	13
Other References.....	14

Setup components

<i>Component</i>	<i>Function</i>
PXE network card	Ask for ip address and network boot image.
DHCP	<u>Provides:</u> ip address to clients additional parameters for network booting: tftp server network boot image file name (syslinux, pxegrub) and config files
TFTP	<u>Provides:</u> network boot image files (syslinux, pxegrub) and config files
HTTP	<u>Provides:</u> Source for SLES9 packages Source for autoyast profiles

The Whole Process



```
Network boot from AMD Am79C970A
Copyright (C) 2003 VMware, Inc.
Copyright (C) 1997-2000 Intel Corporation

CLIENT MAC ADDR: 00 0C 29 D9 06 1F GUID: 5640311B-95BE-9AB5-55E3-A10471D9061F
CLIENT IP: 192.168.74.120 MASK: 255.255.255.0 DHCP IP: 192.168.74.254
GATEWAY IP: 192.168.74.2

Found AMD Lance/PCI at 0x1000, ROM address 0x0000
Probing...[AMD Lance/PCI]The PCI BIOS has not enabled this device!
Updating PCI command 0003->0007. pci_bus 00 pci_device_fm 08
PCnet/PCI-11 79C370A base 0x1000, addr 00:0C:29:D9:06:1F
```

Client requires an ip address (PXE), DHCP leases an ip address and additional parameters for booting up from network (tftp server address and grub's network boot image).

```

GNU GRUB  version 0.96  (586K lower / 522176K upper memory)

autoinstall-dhcp
autoinstall-ip
floppy

Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the
commands before booting, or 'c' for a command-line.

The highlighted entry will be booted automatically in 1 seconds.

```

Grub's Network boot image.

```

GNU GRUB  version 0.96  (586K lower / 522176K upper memory)

dhcp
tftpserver 192.168.74.1
root (nd)
kernel (nd)/linux ramdisk_size=65536 splash=verbose showopts textmode+
initrd (nd)/initrd

Use the ↑ and ↓ keys to select which entry is highlighted.
Press 'b' to boot, 'e' to edit the selected command in the
boot sequence, 'c' for a command-line, 'o' to open a new line
after ('O' for before) the selected line, 'd' to remove the
selected line, or escape to go back to the main menu.

```

Grub's menu.lst file, specifies the tftp server, linux kernel and initrd image to load with additional parameters for automatic installation.

```

Booting 'autoinstall-dhcp'
dhcp
Address: 192.168.74.128
Netmask: 255.255.255.0
Server: 192.168.74.1
Gateway: 192.168.74.2
tftpserver 192.168.74.1
Address: 192.168.74.128
Netmask: 255.255.255.0
Server: 192.168.74.1
Gateway: 192.168.74.2
root (nd)
Filesystem type is tftp, using whole disk
kernel (nd)/linux ramdisk_size=65536 splash=verbose showopts textmode=1 instmod
e=http netconfig=dhcp netdevice=eth0 install=http://192.168.74.1/repositorio/in
stall/sles9/ autoyast=http://192.168.74.1/repositorio/install/profiles/
[Linux-bzImage, setup=0x1400, size=0x1653bd]
initrd (nd)/initrd
fsys_tftp.c:201: warning: LEN > PACKETSIZE (0x598 > 0x200)
-

```

Booting up from network, after loading initial image, SuSE Linux installation starts.

```

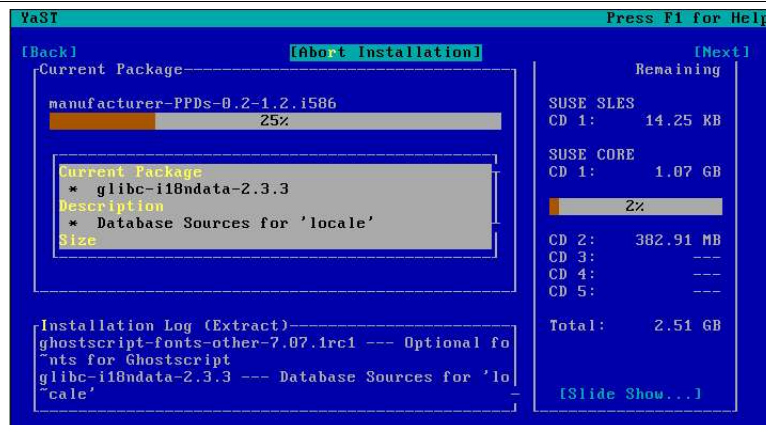
NET: Registered protocol family 1
NET: Registered protocol family 8
NET: Registered protocol family 20
ACPI: (supports S0 S5)
md: Autodetecting RAID arrays.
md: autorun ...
md: ... autorun DONE.
RAMDISK: Compressed image found at block 0
VFS: Mounted root (minix filesystem).
Moving into tmpfs... done.
ramdisk /dev/ram0 freed
created /dev tree (14704 inodes)
>>> SUSE LINUX Enterprise Server 9 installation program v1.6.36 (c) 1996-2004 SUSE LINUX AG <<<
Starting hardware detection...
Searching for info file...
Sending DHCP request to eth0...
Loading data into RAM disk... (56190 kB).....
creating device nodes ... done
integrating the shared objects of the installation system...
starting syslog (messages are logged to /dev/tty4)...
starting klogd ...
integrating kernel modules of the installation system...
starting yast...

```

Starting SuSE Linux installation from the network.



Autoyast's profile file setups the installation process.



Software packages are acquired from http repository.

Index of /repositorio/install/profiles

Name	Last modified	Size	Description
 000C29D9061F	14-Apr-2005 17:38	22K	

Apache/2.0.50 (Linux/SUSE) Server at localhost Port 80

HTTP Profiles Repository.

Index of /repositorio/install/sles9

Name	Last modified	Size	Description
 boot/	07-Apr-2005 17:06	-	
 content	07-Apr-2005 17:06	640	
 control.xml	07-Apr-2005 17:06	17K	
 core9-i386/	11-Apr-2005 15:53	-	
 media.i/	13-Apr-2005 15:53	-	
 sles9-i386/	08-Apr-2005 17:49	-	
 vast/	08-Apr-2005 17:57	-	

Apache/2.0.50 (Linux/SUSE) Server at localhost Port 80

HTTP Software Repository.

Installation Server Software

Install the following software packages.

dhcp server (ISC, included with SLES9).

tftp (tftp-ha, included with SLES9, required to acquire network booting images for network booting).

Apache Web Server (Apache2, HTTP Repository for software packages and autoyast profiles, included with SLES9).

(optional) YaST, and YaST modules for autoyast (included with SLES9).

Building the SLES software repository

Follow this URL to build the SLES9 packages repository.

<http://www.suse.de/~nashif/autoinstallation/9.1/html/ch05s02.html>

Combining multiple sources requires that all sources comply to the UnitedLinux media description standard.

In the source directory, copy all SLES and CORE into separate directories (CDs can also be copied into one single directory, but to keep a clean structure, CDs can be copied into separate directories, i.e. using the following scheme: CORE9/CD1, CORE9/CD2, CORE9/CD3 . CORE9/CD4, CORE9/CD5 and SLES/CD1.)

Upon boot, Linuxrc requires the presence of the boot directory (which contains the `root` file), the `media.N` directory the `control.xml` file and the `content` file. Having those files in the root of the source will insure that linuxrc can start the YaST installer.

Once YaST has started, it will search the root of source for installation files using values from the `content` file name. However, to detect if multiple sources are involved, YaST first search for the `order` and `instorder` in the `yast` directory.



Author: Adrián Malaguti, Consultant, Novell South of Latin America
amaloguti@novell.com

6 of 14

Novell.

The files in the `yast` directory will reroute YaST and direct it to search for the installation files and media description in different locations than root of the source.

On the installer source create a `yast/order` as described above and enter the location of the description data and packages. Alternatively, you can copy the description data of all sources to separate directories in the `yast` directory (This is the case on the SLES CD which contains the description data for CORE to support multiple sources using CDs).

In the 'order' example above, the 'order' directory structure looks as follows:

Example using SLES9:

```
#!/bin/sh

instsource="/exports/sles9"
#
# Create CD directories
#
cd $instsource
mkdir -p sles9-i386/CD1
mkdir -p core9-i386/CD{1,2,3,4,5}

#
# Copy SLES CD
#
cd sles9-i386/CD1

mount -oloop /iso/SLES-9-i386-CD1.iso /mnt
cp -a /mnt/* .
umount /mnt

#
# back to root of source
#
cd ../../..

#
# Copy UL CDs
#

# 1
cd core9-i386/CD1
mount -oloop /iso/CORE9-i386-CD1.iso /mnt
cp -a /mnt/* .
umount /mnt

# 2
cd ../CD2
mount -oloop /iso/CORE9-i386-CD2.iso /mnt
cp -a /mnt/* .
umount /mnt

# 3
cd ../CD3
mount -oloop /iso/CORE9-i386-CD3.iso /mnt
cp -a /mnt/* .
umount /mnt

#
# Copy all other CDs...
#

#
# back to root of source
#
cd ../../..
```

```

#
# Now we have to symlink some data to make this
# a multiple source directory
#

# Then the boot directory with the installation image
#
ln -s sles9-i386/CD1/boot

# The content file and the media directory
#
ln -s sles9-i386/CD1/content
ln -s sles9-i386/CD1/control.xml
ln -s sles9-i386/CD1/media.1

# We are almost done..
# Now we'll adapt the order files.
# Fields of the order files are TAB delimited

mkdir -p yast

printf "/sles9-i386/CD1\t/sles9-i386/CD1\n" > yast/order
printf "/core9-i386/CD1\t/core9-i386/CD1\n" >> yast/order

printf "/sles9-i386/CD1\n" > yast/instorder
printf "/core9-i386/CD1\n" >> yast/instorder

#
# End
#

```

After you have gone through all steps, you will have a structure similar to the one shown below.

```

|-- sles9-i386
|   |-- CD1
|       |-- boot
|       |-- docu
|       |-- media.1
|       |-- suse
|       `-- yast
|-- core9-i386
|   |-- CD1
|   |-- CD2
|   |-- CD3
|   |-- CD4
|   `-- CD5
|-- boot -> sles9-i386/CD1/boot
|-- media.1 -> sles9-i386/CD1/media.1
|-- content -> sles9-i386/CD1/content
|-- control.xml -> sles9-i386/CD1/control.xml
`-- yast

```

And the root of the source will have the following content:

```

linux:/tmp/shared/install/sles9 # pwd
/tmp/shared/install/sles9
linux:/tmp/shared/install/sles9 # ls -l
boot -> sles9-i386/CD1/boot
content -> sles9-i386/CD1/content

```



Author: Adrián Malaguti, Consultant, Novell South of Latin America
amalaguti@novell.com

8 of 14

Novell.


```
control.xml -> sles9-i386/CD1/control.xml
core9-i386
media.1 -> sles9-i386/CD1/media.1
sles9-i386
yast
linux:/tmp/shared/install/sles9 #
```

Enabling HTTP Access to SLES9 Repository

In this setup, SLES9 CDs were copied to /tmp/shared/install.

Create directory 'repository' under apache2 DocumentRoot (/srv/www/htdocs).

Create symlink 'install' below /srv/www/htdocs/repository, pointing to the location where SLES9 CDs were copied, /tmp/shared/install.

```
linux:/srv/www/htdocs # pwd
/srv/www/htdocs
linux:/srv/www/htdocs # ls -l repositorio/
install -> /tmp/shared/install
linux:/srv/www/htdocs #
```

Edit /etc/apache2/default-server.conf. Add the following paragraph:

```
<Directory "/srv/www/htdocs/repositorio">
    Options Indexes Multiviews FollowSymLinks
    Order allow,deny
    Allow from all
</Directory>
```

Start apache2, and configure it to start up on boot.

```
rcapache2 start
insserv apache2
```

Note:

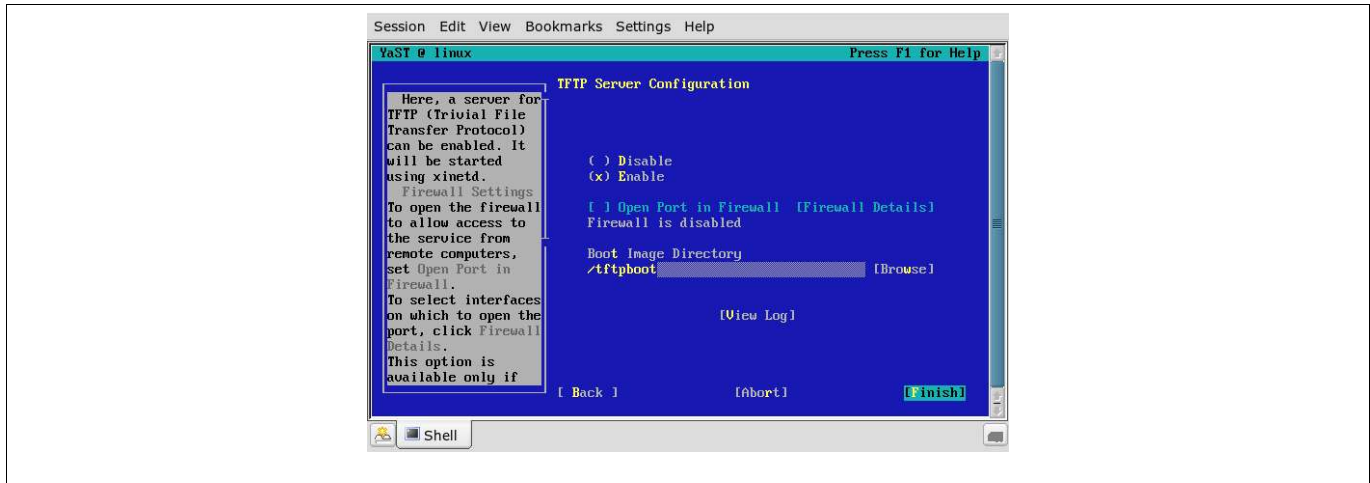
This repository can be easily configured using the YaST Installation Server module.

Install TFTP Server

Install tftp and yast2-tftp-server modules.

Enable tftp using YaST->Network Services->TFTP Server

Select /tftpboot as Boot Image Directory.



To stop/start the tftp server you have to use xinetd, rcxinetd start|stop, in case you wish to disable it, you have to edit /etc/xinetd.d/tftp.

Prepare network boot images

The tftp server is used for store the network boot images and linux kernels to launch the install process.

I tried two alternatives for network boot images, syslinux (pxelinux) or grub (pxegrub).

syslinux - <http://syslinux.zytor.com/>

The SYSLINUX Project covers lightweight bootloaders for floppy media (SYSLINUX), network booting (PXELINUX), and bootable "El Torito" CD-ROMs (ISOLINUX).

Download syslinux from the web, open the zip file and copy pxelinux.0 to /tftpboot. Create directory /tftpboot/pxelinux.cfg. This directory will store the config files.

From pxelinux.doc (inside the zip file):

'...Finally, create the directory "/tftpboot/pxelinux.cfg". The configuration file (equivalent of syslinux.cfg -- see syslinux.doc for the options here) will live in this directory. Because more than one system may be booted from the same server, the configuration file name depends on the IP address of the booting machine. PXELINUX will search for its config file on the boot server in the following way:

First, it will search for the config file using the hardware type (using its ARP type code) and address, all in lower case hexadecimal with dash separators; for example, for an Ethernet (ARP type 1) with address 88:99:AA:BB:CC:DD it would search for the filename 01-88-99-aa-bb-cc-dd.

Next, it will search for the config file using its own IP address in upper case hexadecimal, e.g. 192.0.2.91 -> C000025B (you can use the included program "gethostip" to compute the hexadecimal IP address for any host.)

If that file is not found, it will remove one hex digit and try again. Ultimately, it will try looking for a file named "default" (in lower case).

As an example, if the boot file name is /mybootdir/pxelinux.0, the Ethernet MAC address is 88:99:AA:BB:CC:DD and the IP address 192.0.2.91, it will try:

```
/mybootdir/pxelinux.cfg/01-88-99-aa-bb-cc-dd
/mybootdir/pxelinux.cfg/C000025B
/mybootdir/pxelinux.cfg/C000025
/mybootdir/pxelinux.cfg/C00002
/mybootdir/pxelinux.cfg/C0000
/mybootdir/pxelinux.cfg/C000
/mybootdir/pxelinux.cfg/C00
/mybootdir/pxelinux.cfg/C0
/mybootdir/pxelinux.cfg/C
/mybootdir/pxelinux.cfg/default
```

... in that order.'

TFTP Server content using syslinux:

```
linux:/tftpboot # pwd
/tftpboot
linux:/tftpboot # ls -lR
initrd (initrd image)
linux (kernel)
pxelinux.0 (network boot image)
./pxelinux.cfg:
00-0C-29-60-0D-6B (pxelinux config file for 00:0C:29:60:0D-6B)
00-0c-29-d9-06-1f (pxelinux config file for 00:0C:29:D9:06:1F)
default (pxelinux default config file)
linux:/tftpboot #
```

grub - <http://www.gnu.org/software/grub/>

Download and compile (it requires gcc, make, binutils and texinfo) with network support and common drivers (--enable-lance in my example). Then copy pxegrub to /tftpboot. pxegrub uses the file menu.lst.

Read grub/README, grub/INSTALL and grub/netboot/README.netboot.

Also check grub's online manual - <http://www.gnu.org/software/grub/manual/grub.html>

```
# Download grub from the web
export CVS_RSH="ssh"
cvs -z3 -d:ext:anoncvs@savannah.gnu.org:/cvsroot/grub co grub

# Compile and install in a temporary location
mkdir /tmp/grub/
./configure --prefix=/tmp/grub/ --enable-diskless --enable-lance
make ; make check ; make install

# Copy pxegrub to /tftpboot
cp /tmp/grub/pxegrub /tftpboot
```

Then, customize or create your own menu.lst in /tftpboot:

```
/tftpboot/menu.lst:
color white/blue black/light-gray
default 0
timeout 3
framebuffer 1
```



Author: Adrián Malaguti, Consultant, Novell South of Latin America
amalaguti@novell.com

11 of 14

Novell.

```

title autoinstall-dhcp
    dhcp
    tftpserver 192.168.74.1
    root (nd)
    kernel (nd)/linux ramdisk_size=65536 splash=verbose showopts textmode=1 instmode=http netconfig=dhcp
netdevice=eth0 install=http://92.168.74.1/repositorio/install/sles9/
autoyast=http://192.168.74.1/repositorio/install/profiles/
    initrd (nd)/initrd

#title autoinstall-ip
#    ifconfig --address=192.168.1.50 --server=192.168.1.1
#    root (nd)
#    kernel (nd)/linux install=nfs://192.168.1.1/work/CDs/full-i386 ip=192.168.1.50 netmask=255.255.255.0
#    initrd (nd)/initrd

#title floppy
#    root (fd0)
#    chainloader +1

```

Notes about menu.lst:

autoyast=http://x.x.x.x/yy/profiles/ (resolves profile name based on mac address, ex:/profiles/000C29D9061F)

autoyast=http://x.x.x.x/yy/profiles/profile.xml (only use /profiles/profile.xml)

TFTP Server content using pxegrub:

```

linux:/home/amalaguti # cd /tftpboot/
linux:/tftpboot # ls -l
    initrd (initrd image)
    linux (kernel)
    menu.lst (pxegrub config file)
    pxegrub (pxegrub boot image)
linux:/tftpboot #

```

Install DHCP server

Install and configure DHCP Server if you don't have one available yet.

You need to add support for network boot requests and pass some option codes to clients to allow network booting.

This is my example file, using vmware (it uses an old version of isc dhcp, you may have to check your dhcp server software documentation).

```

linux:/tftpboot # cat /etc/vmware/vmnet8/dhcpd/dhcpd.conf
#
# Configuration file for ISC 2.0b6pl1 vmnet-dhcpd operating on vmnet8.
#
# Allow netboot requests
allow bootp;
allow booting;
allow unknown-clients;
default-lease-time 1800;           # 30 minutes
max-lease-time 7200;              # 2 hours

subnet 192.168.74.0 netmask 255.255.255.0 {

```

```

range 192.168.74.128 192.168.74.254;
option broadcast-address 192.168.74.255;
option domain-name-servers 192.168.74.2;
option domain-name "localdomain";
option routers 192.168.74.2;
}

group {
# PXE related stuff
# TFTP Server
next-server 192.168.74.1;
# If syslinux is in use, the netboot image is pxelinux.0, config files are in /tftpboot/pxelinux.cfg/
#filename "pxelinux.0";

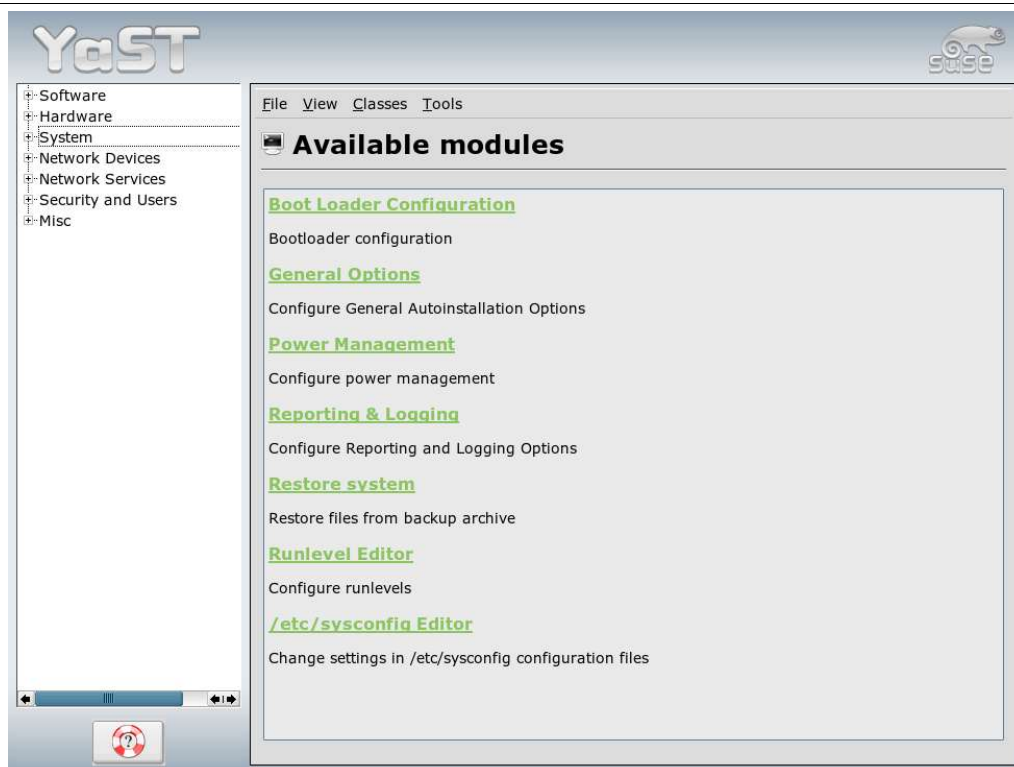
# If using pxegrub, the netboot image is pxegrub, and the config file for pxegrub is menu.lst
filename "pxegrub";
option option-150 "(nd)/menu.lst";

# Hosts list.
host vm1 { hardware ethernet 00:0C:29:D9:06:1F; }
host vm2 { hardware ethernet 00:0C:29:60:0D:6B; }
}
linux:/tftpboot #

```

Create the control file

Start AutoYaST module to edit an autoyast profile (YaST->Misc->Autoinstallation), just play for a while and have fun.... it's plenty of options and nice features out of the scope of this document.



When you get a working profile, save a copy of it in your http profiles repository, in my case, <http://192.168.74.1/repositorio/install/profiles/>.

Index of /repositorio/install/profiles

Name	Last modified	Size	Description
 000C29D9061F	14-Apr-2005 17:38	22K	

Apache/2.0.50 (Linux/SUSE) Server at localhost Port 80

```
<?xml version="1.0"?>
<!DOCTYPE profile SYSTEM "/usr/share/autoinstall/dtd/profile.dtd">
<profile xmlns="http://www.suse.com/1.0/yast2ns" xmlns:config="http://www.suse.com/1.0/configs">
  <configure>
    . . .
    . . .
  </configure>
  <software>
    <addons config:type="list">
      <addon>Base-System</addon>
      <addon>Basis-Sound</addon>
      <addon>HA</addon>
      <addon>Kde-Desktop</addon>
      <addon>LSB</addon>
      <addon>Linux-Tools</addon>
      <addon>Print-Server</addon>
      <addon>SuSE-Documentation</addon>
      <addon>X11</addon>
      <addon>YaST2</addon>
      <addon>analyze</addon>
      <addon>auth</addon>
    </addons>
    <base>default</base>
    <packages config:type="list">
      <package>lsb</package>
      <package>XFree86-devel</package>
      <package>aide</package>
      <package>apache2</package>
    </packages>
  </software>
</profile>
```

That's all.... I think. Good luck.

Other References

<http://yast.suse.com/>

<http://www.suse.de/~nashif/autoinstallation/>

https://wiki.innerweb.novell.com/wiki.phtml?title=Slide_Decks_-_Jo_De_Baer



Author: Adrián Malaguti, Consultant, Novell South of Latin America
amalaguti@novell.com

14 of 14

Novell.